


EF 903 178 214 US

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PTO/SB/05 (4/98)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. AT9-98-267First Inventor or Application Identifier David A. Mumsick, Jr.Title Method and apparatus for General...Express Mail Label No. EF 903 178 214 US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 28]
(preferred arrangement set forth below)
 - Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the invention
 - Brief Summary of the invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 5]
4. Oath or Declaration [Total Pages 6]
 - a. ☒ Newly executed (original or copy)
 - b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
 - i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

ADDRESS TO: Assistant Commissioner for Patents
 Box Patent Application
 Washington, DC 20231

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
 - a. ☐ Computer Readable Copy
 - b. ☐ Paper Copy (identical to computer copy)
 - c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney (when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure Statement (IDS)/PTO-1449
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
13. ☐ * Small Entity Statement(s) (PTO/SB/09-12)
14. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
15. ☐ Other: _____

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No. _____

Prior application information: Examiner _____ Group / Art Unit: _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Date

12/3/98

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FEE TRANSMITTAL

Patent fees are subject to annual revision on October 1.

These are the fees effective October 1, 1997.

Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12. See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT (\$) 1234.00

Complete if Known

Application Number	
Filing Date	
First Named Inventor	David L. Ehrlichstein et al
Examiner Name	
Group / Art Unit	
Attorney Docket No.	A19-98-267

METHOD OF PAYMENT (check one)

- 1.
- ☒
- The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number 09-0447
 Deposit Account Name IBM Corporation

- ☒
- Charge Any Additional Fee Required Under 37 C.F.R. §§ 1.16 and 1.17
-
- ☐
- Charge the Issue Fee Set in 37 C.F.R. § 1.18 at the Mailing of the Notice of Allowance

- 2.
- ☐
- Payment Enclosed:

☐ Check ☐ Money Order ☐ Other
FEE CALCULATION**1. BASIC FILING FEE**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 790	201 395	Utility filing fee	760.
106 330	206 165	Design filing fee	
107 540	207 270	Plant filing fee	
108 790	208 395	Reissue filing fee	
114 150	214 75	Provisional filing fee	

SUBTOTAL (1) (\$) 760

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
29	-20** = 9	18.	162.
Independent Claims	7	3** = 4	78.
Multiple Dependent			0-

**or number previously paid, if greater; For Reissues, see below

Large Entity Small Entity

Fee Code (\$)	Fee Code (\$)	Fee Description
103 22	203 11	Claims in excess of 20
102 82	202 41	Independent claims in excess of 3
104 270	204 135	Multiple dependent claim, if not paid
109 82	209 41	** Reissue independent claims over original patent
110 22	210 11	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$) 474.00

FEE CALCULATION (continued)**3. ADDITIONAL FEES**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet.	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 400	216 200	Extension for reply within second month	
117 950	217 475	Extension for reply within third month	
118 1,510	218 755	Extension for reply within fourth month	
128 2,060	228 1,030	Extension for reply within fifth month	
119 310	219 155	Notice of Appeal	
120 310	220 155	Filing a brief in support of an appeal	
121 270	221 135	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,320	241 660	Petition to revive - unintentional	
142 1,320	242 660	Utility issue fee (or reissue)	
143 450	243 225	Design issue fee	
144 670	244 335	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
126 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	
146 790	246 395	Filing a submission after final rejection (37 CFR 1.129(a))	
149 790	249 395	For each additional invention to be examined (37 CFR 1.129(b))	
Other fee (specify) _____			
Other fee (specify) _____			

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$)

SUBMITTED BYTyped or Printed Name David A. Mims, JRSignature David A. Mims Jr.Date 12/3/98**Complete (if applicable)**Reg. Number 32 708

Deposit Account User ID

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**METHOD AND APPARATUS FOR GENERAL INTEGRITY RULE CHECKING
POINT IN AN APPLICATION**

5 **CROSS REFERENCE TO RELATED APPLICATION**

The present invention is related to applications entitled
Method And Data Processing System For Specifying And
Applying Rules To Classification-Based Decision Points In
An Application System, attorney docket no. AT9-98-287,
10 filed even date hereof, assigned to the same assignee;
and Method And Apparatus For Applying Business Rules In
An Object Model Driven Context, attorney docket no. AT9-
98-266, filed even date hereof, assigned to the same
assignee, which are incorporated herein by reference.

15

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates generally to an
20 improved data processing system and in particular to an
improved method and apparatus for managing a business
application system that relies on a large number of
business rules. Still more particularly, the present
invention relates to an improved method and apparatus for
25 checking application state integrity through externalized
rules in a business system.

2. Description of Related Art:

Businesses use a wide variety of computer hardware
30 and software products, for many different purposes. The
hardware of a typical business information system
includes a multitude of interconnected computers,

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printers, scanners, communications equipment, and other peripheral devices, allowing the business to automate much of the processing of its business information. The computers may be of different types, such as mainframes, 5 minicomputers, or network servers supporting client workstations (personal computers, or PCs), or some combination of the foregoing. Business software includes (without limitation) accounting, word processing, database management, communications, publishing, and 10 multimedia presentation software, as well as payroll, financial planning, project management, decision and support, personnel records, and office management software and further including specific business applications such as insurance claims and losses, credit 15 approval, order entry and inventory, etc. All of these programs can run on a variety of platforms, including different operating systems. Businesses often have an Information Services or Information Technology (IT) department which is responsible for the overall 20 management, support and planning of the company's information system needs.

One of the claims for object-oriented programming is that it makes it easier for software to model real-life business situation. The new vision of 25 computing is of distributed Business Objects existing as independently developed executables or binaries, which can be redeployed as self-contained units anywhere in a network, and on any platform. While this represents a step forward, businesses are finding that encapsulating 30 business logic into Business Objects provides

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insufficient additional flexibility over that provided by procedural-based applications.

Although the term Business Object has been in widespread use, no formal definition existed until the
5 Object Management Group's (OMG) Business Object
Management Special Group (BOMSIG) took the task of
developing a consensus meaning for the term. Business
Objects are representations of the nature and behavior of
real world things or concepts in terms that are
10 meaningful to the business. Customers, products, orders,
employees, trades, financial instruments, shipping
containers and vehicles are all examples of real-world
concepts or things that could be represented by Business
Objects. Business Objects add value over other
15 representations by providing a way of managing
complexity, giving a higher level perspective, and
packaging the essential characteristics of business
concepts more completely. We can think of Business
Objects as actors, role-players, or surrogates for the
20 real world things or concepts that they represent.

Implementing rules within Business Objects enables
businesses to quickly change their automated policies and
practices as business conditions change. For example,
during the execution of an application, business rules
25 can be used to decide whether to extend credit to a
customer and if so under what terms. By implementing
these determinations as externalized rules, they can be
changed as needed without reworking the application that
uses them.

30 Historically, developers creating business
applications have embedded the rules of these

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applications directly in the applications themselves. Developers have built these systems without explicit regard for the changing nature of business rules. As a result, when business policies and practices change - and
5 they're constantly changing - it's difficult, costly, and time consuming to reflect those changes in the applications that implement them.

More recently, developers have implemented business rules in database triggers. In response to database
10 changes, database triggers are automatically invoked by a database server. The code in the triggers can execute some procedural logic as well as manipulate the database. Database triggers and stored procedures offer the advantage of modularity. They isolate business rules and
15 technical data-manipulation rules from application logic. Triggers automate business rules processing and provide application independence (any application changing the database causes the triggers to be fired). However, triggers also have some serious disadvantages. They are
20 hard to develop. They are intended to implement technical data-manipulation rules as well as business rules, and they are hard to maintain and extend particularly when they are used to implement business policies and practices.

25 Database triggers are frequently expressed in the dialect of the databases in which they're to be implemented. These languages are frequently proprietary and complex. Development is a text-editing task. There are few, if any, visual tools to assist developers in
30 specifying trigger code.

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Database triggers function on the elements and values of a database. Their specification is far more technically oriented than business oriented. Some triggers implement business rules, but many implement and enforce data integrity and data consistency.

Applications builders who are using a trigger built by another developer might have difficulty deducing the business rules implemented by the trigger by looking at trigger code. Business analysts, the individuals who should be responsible for business rules specification, frequently find the triggers hard to learn and understand.

Database triggers are also hard to maintain. Developers may find it difficult to change triggers in response to business changes. Trigger development rarely fits into the overall flow of large-scale object-oriented application development. As a result, triggers tend to be hard to understand and relate to the application's business logic.

More recently, object-oriented business rules technologies have evolved which allow rules to route work through the tasks of a business process, where reasoning can be applied to complex decision-making, and where knowledge systems can perform operator assistance.

Object-oriented business rules technologies base rule processing on an application's object model or component model. Some products based on these technologies use inferencing techniques on an application's object model to create, delete, and manipulate variables and objects and to determine their values. Other products utilize a technique which always

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fires a rule before or after an object method. Both of these techniques are very programmer intensive, as they are built right into the objects themselves.

Business rules are different from Business Objects.

- 5 Business Objects represent business entities like customers, products, and orders. They encapsulate the data and behavior needed to perform business functions. Business rules implement the policies and practices of an organization. They control the ways that Business
- 10 Objects perform business functions. However, problems still exist for developers in specifying, identifying, and managing rules for an application.

- As businesses have moved to object-oriented applications as a means of making them more flexible and
- 15 adaptable to changes in their business, these businesses are finding that encapsulating business logic in business objects provides insufficient additional flexibility over that provided by the procedural-based applications they have written for years. One result is that businesses
- 20 are now looking toward externalizing business decisions into business rules, which are described and manipulated by business experts instead of by programmers.

- Furthermore, a large number of general integrity rules are present, which gives the application the flexibility
- 25 it needs to function in a "generic" manner. Typically, these rules always have to be true except possibly during some specific rule free period such as during the middle of a business operation. Constantly checking these type of general integrity rules all of the time is
- 30 impractical.

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Therefore, it would be advantageous to have an improved method and apparatus for general integrity rule checking to be performed just before the completion of a business function.

2025 RELEASE UNDER E.O. 14176

SUMMARY OF THE INVENTION

The present invention provides a method and
5 apparatus for performing general integrity checks using
rules in an application running on a data processing
system. A point is identified at which a unit of work is
to complete. The unit of work includes a plurality of
participants. Responsive to determining that the unit of
10 work is to complete, rules associated with each
participant in the unit of work are obtained. Responsive
to obtaining the rules, the rules obtained for each of
the participants are run. Responsive to running the
rules, the general integrity of the system with respect
15 to the unit of work is determined. Responsive to
determining the general integrity of the application
state, the unit of work is completed by committing it or
aborting it.

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BRIEF DESCRIPTION OF THE DRAWINGS

5 The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed
10 description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is an illustration of a general integrity rule checking system in accordance with a preferred embodiment of the present invention;

15 **Figure 2** is an object interaction diagram for a unit of work control point in accordance with a preferred embodiment of the present invention;

Figure 3 is an illustration of a unit of work in accordance with a preferred embodiment of the present
20 invention;

Figure 4 is a flowchart of a process in a control point for searching for and applying rules to a unit of work in accordance with a preferred embodiment of the present invention; and

25 **Figure 5** is a block diagram of a data processing system in which the present invention may be implemented.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5 The present invention provides a method, apparatus,
and instructions for general integrity checking with
rules in business and enterprise applications. The
present invention provides the use of control points and
units of work as a mechanism for identifying relevant
10 integrity check times. A control point in the depicted
examples is a decision point or a point of variability to
which rules can be associated to implement variable
behavior. The variable behavior can be changed by
associating different rules with the decision point or by
15 changing the process for rules already associated with
the decision point. A number of different types of
decision points are available. Some decision points
imply a particular function while others do not imply
one. This makes the capabilities of decision points very
20 dynamic and places control in the hands of an individual
who establishes the associations between the rules and
the identified decision points.

 The present invention applies the use of a control
point, also referred to as a trigger point, at a point in
25 the logic of an application, that occurs just as a unit
of work completes. When this Unit of Work Control Point
is encountered during the normal execution of the
application, the participants in the unit of work are
identified. Rules associated with the unit of work for
30 each participant are obtained and run. The Unit of Work

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Control Point determines whether an integrity failure has occurred. In the examples that follow, a logical AND type of combining is used to combine the results from running the rules.

5 Control points are described in more detail in the Method and Apparatus for Identifying Applicable Business Rules, Attorney Docket AT9-97-503, Filed 12/18/97, Application Serial No. 09/993,718, signed to the same Assignee, and incorporated herein by reference. Units of
10 work in the present invention provides structural support for "work", which may be, for example, business tasks and processes. A unit of work may represent an application level structure. Units of work may follow the structures of the work done by employees and associates of a
15 business. Natural structuring is provided whether or not each unit of work is totally or even partially automated. A unit of work may be started and once started, it may be suspended and subsequently resumed. In the depicted examples, a unit of work continues to exist until it
20 completes and may do so by committing or aborting.

The present invention employs unit of work that represent pieces of business work and define each business context in which they are carried out. Such units of work are well known to those skilled in the art.
25 The unit of work maintains a list of participants modified by processing carried out in association with the unit of work. Until and unless the unit of work commits, state changes made to those participants are not visible to processing associated with other units of
30 work. From a business perspective, such a unit of work

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is a work in progress. If a unit of work completes by aborting, state changes to participants made as a part of its processing disappear. If the unit of work completes by committing, the state of the system is changed such
5 that all of the changes to participants made during the unit of work become persistent and visible to all subsequently started units of work.

As shown in **Figure 1**, the preferred mode of use of the present invention employs a unit of work which
10 contains a trigger point 100 in addition to the usual list of participants 102-108. The trigger point serves as a mechanism for identifying the point in transaction commit processing just after the application has decided to commit a transaction. Just before commit processing
15 begins, processing encounters the trigger point. Logic in the trigger point selects rules for the participants and runs them. Each rule checks the state of one or more participants and returns to the trigger point its judgment on whether the unit of work has maintained some
20 feature that is important to the integrity of the application state. Based on the collective judgment of the rules, the control point determines whether the unit of work as a whole passes the integrity check. In the depicted example, a logical AND type of combining is used
25 to combine the results of running the rules. If the collective judgment of the rules is that application state integrity has been maintained, the transaction is allowed to commit its changes to persistent storage. If the rules detect an integrity violation, the transaction
30 is rolled back.

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With reference now to **Figure 2**, an object interaction diagram for a theft loss function is depicted in accordance with a preferred embodiment of the present invention. Diagram **200** illustrates an exemplary scenario
5 in an insurance claim program involving the recording of a theft of golf clubs from an automobile while the owner was on vacation in Mexico. In this example, the policy does not cover theft of personal property when the theft occurs in Mexico.

10 The participant business objects in capturing the loss/recording of the claim include owner **202**, vehicle **204**, personal property (golf clubs) **206**, loss **208**, loss location **210**, and policy **212**.

In recording this loss, the claimant owner is
15 identified (step **214**). After identifying the owner, the policy is obtained (step **216**). The next step occurs in step **218** in which the vehicle is identified. Thereafter, the personal property is recorded in step **220** and the loss location is recorded in step **222**. After these
20 steps, a commit is performed for the theft loss in step **224**, which will result in the control point **226**, represented as a target in diagram **200**, being encountered when Loss **208** tells the unit of work to commit. The control point finds rules for two of the participants in
25 the unit of work (policy **212** and vehicle **204**), which determine whether the loss of the property was covered and whether the lost property was too big to fit within the vehicle. If the loss property was too big to fit into the vehicle, the claim will be denied for possible
30 fraud or mistake in entry of personal property. For

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example, if the personal property was identified as a refrigerator, it is likely that the refrigerator is too large to fit within a vehicle depending on the vehicle type identified in step 218.

5 Turning now to **Figure 3**, an illustration of a unit of work is depicted in accordance with a preferred embodiment of the present invention. Unit of work 300 is a theft loss unit of work in this example. Unit of work 300 accumulates participants in a business transaction.

10 The participants in this example include an owner 302, a policy 304, a vehicle 306, a loss 308, a personal property 310, and a loss location 312. Owner 302 is added when the claimant is identified in step 214 in **Figure 2**. Policy 304 is added to unit of work 300 when

15 the policy is obtained. Identification of the vehicle in step 218 of **Figure 2** results in the adding of vehicle 306 to unit of work 300. Loss 308 is added to unit of work 300 when the personal property is forwarded to loss 208 in **Figure 2**. Personal property 310 is added when the

20 personal property is recorded in step 220 in **Figure 2**.

 A commit of the unit of work 314 will result in the unit of work commit control point cycling through the participants looking for integrity rules for each, associated with the type of unit of work; theft loss in

25 this case. In this example, owner 302 has no rules for theft loss type of unit of work. Policy 304 does have a rule for unit of work 300, which is a covered loss rule. The covered loss rule is fired. In this example, the Covered Loss rule examines the loss location and

30 determines that personal property was stolen from a

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vehicle when the vehicle was located in Mexico. Such a loss is not covered according to the rule for policy **304**. As a result, the rule returns a false, indicating failure. Thereafter, the unit of work **300** aborts the
5 commit because the cumulative set of objects is not consistent.

Had the covered loss rule not failed, the class rule for vehicle **306** for this theft loss unit of work would be obtained and applied. In this example, this rule, the
10 vehicle's "I'm not big enough" rule, for the theft loss unit of work would have been applied, which for this example, prohibits refrigerators from being claimed as personal property loss from a small vehicle. The unit of work would look for integrity rules related to theft loss
15 for the other participants. In this example, the other participants within the theft loss unit of work have no associated integrity rules, so the commit would complete.

With reference now to **Figure 4**, a flowchart of a process in a unit of work in which an integrity control
20 point is encountered during commit processing and which searches for and applies general integrity rules, is depicted in accordance with a preferred embodiment of the present invention. The process begins with a unit of work commit (step **400**). In step **400**, a unit of work control
25 point is encountered in the commit processing in an application system. The unit of work control point attempts to locate integrity rules associated with a participant and the particular function the unit of work represents (step **402**). In step **402**, rules are identified
30 and managed based on the names of participants and

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optionally on the type of function the unit of work represents. There may be no rules, one rule or multiple rules associated with verifying the integrity of the participant in the context of the unit of work.

5 If rules are present for a participant, these rules are run (step 404). Applicable rules are provided with the entire list of participants so that the integrity of the participant with respect to the entire system can be verified. The results of running the rules for the
10 participant are combined (step 406). Next, a determination is made as to whether a rule failure has occurred (step 408). A failure occurs in the depicted example if the combined results of running the rules for a participant is negative. In the depicted example, the
15 unit of work control point aborts the commit processing when this happens (step 410). In addition, when the unit of work control point aborts in step 410, the rule failure may be reported.

On the other hand, if a rule failure does not occur,
20 a determination is made as to whether other participants are present (step 412). If other participants are present, a search for and firing of rules is repeated for this and other participants using steps 402-412. The unit of work control point does this for every
25 participant even though there may be no rules for the participant to verify in the context of the unit of work.

With reference again to step 412, when there are no other participants to be given the opportunity the integrity of the application, then the unit of work is

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completed, committing changes introduced by this unit of work in the usual way (step 414).

Thus, the present invention allows for every rule for a unit of work to be provided with the entire set of participants in the unit of work to ensure system integrity from the perspective of each participant. The control point for a unit of work according to the present invention allows rules associated with participants in the unit of work to examine relationships participants for completeness, accuracy, and overall integrity.

With reference now to **Figure 5**, a block diagram of a data processing system in which the present invention may be implemented is illustrated. Data processing system 500 is an example of a client computer. Data processing system 500 employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Micro Channel and ISA may be used. Processor 502 and main memory 504 are connected to PCI local bus 506 through PCI bridge 508. PCI bridge 508 also may include an integrated memory controller and cache memory for processor 502. Additional connections to PCI local bus 506 may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter 510, SCSI host bus adapter 512, and expansion bus interface 514 are connected to PCI local bus 506 by direct component connection. In contrast, audio adapter 516, graphics adapter 518, and audio/video adapter (A/V) 519 are connected to PCI local bus 506 by add-in boards inserted into expansion slots. Expansion bus interface

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514 provides a connection for a keyboard and mouse adapter 520, modem 522, and additional memory 524. SCSI host bus adapter 512 provides a connection for hard disk drive 526, tape drive 528, CD-ROM drive 530, and digital video disc read only memory drive (DVD-ROM) 532 in the depicted example. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor 502 and is used to coordinate and provide control of various components within data processing system 500 in **Figure 5**. The operating system may be a commercially available operating system such as OS/2, which is available from International Business Machines Corporation. "OS/2" is a trademark of International Business Machines Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provides calls to the operating system from Java programs or applications executing on data processing system 500. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk drive 526 and may be loaded into main memory 504 for execution by processor 502.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 5** may vary depending on the implementation. For example, other peripheral devices, such as optical disk drives and the like may be used in addition to or in place of the hardware depicted in **Figure 5**. The depicted example is not meant to imply

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architectural limitations with respect to the present invention. For example, the processes of the present invention may be applied to multiprocessor data processing system and may be implemented for use in a network in a distributed manner.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in a form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard disk drive, a RAM, and CD-ROMs and transmission-type media such as digital and analog communications links.

The description of the present invention has been presented for purposes of illustration and description, but is not limited to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated

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1

2 **CLAIMS:**

3 What is claimed is:

1 1. A method for performing general integrity checks
2 using rules in an application running on a data
3 processing system comprising:

4 identifying a point in a unit of work where
5 application state integrity is to be verified, wherein
6 the unit of work includes a plurality of participants;
7 responsive to determining that the unit of work is
8 to be completed, obtaining rules associated with each
9 participant in the unit of work;

10 responsive to obtaining the rules, running the rules
11 obtained for each of the participants to verify the
12 integrity of an application state, according to the
13 plurality of participants;

1 2. The method of claim 1, further comprising:

2 responsive to a negative result obtained by running
3 the rules, aborting the unit of work.

1 3. The method of claim 1, further comprising:

2 responsive to a positive result obtained by running
3 the rules, committing the unit of work.

1 4. The method of claim 1, wherein each participant is
2 associated with a name and wherein the step of obtaining
3 rules associated with each participant in the unit of

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4 work comprises obtaining rules based on the name
5 associated with the participant.

1 5. The method of claim 4, wherein the plurality of
2 participants are a plurality of objects and wherein the
3 name associated with an object within the plurality of
4 objects is the class name of a participating object.

1 6. The method of claim 1, wherein each participant is
2 associated with a name, wherein the unit of work is
3 associated with a type, and wherein the step of obtaining
4 rules associated with each participant in the unit of
5 work comprises obtaining rules based on the name
6 associated with the participant and the type associated
7 with the unit of work.

1 7. The method of claim 1, wherein at least zero
2 integrity checking rules are associated with each
3 participant within the plurality of participants;

1 8. A method in a data processing system for performing
2 general integrity checks using rules, the method
3 comprising:
4 detecting a commit for a unit of work;
5 identifying participants in the unit of work in
6 response to detecting the commit for the unit of work;
7 determining whether rules are present for the
8 participants in the unit of work;
9 running the rules for participants identified as
10 having at least one rule;

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11 determining whether a violation of an integrity rule
12 within the rules identified for any participant has
13 occurred; and
14 committing the unit of work depending on the results
15 of running the rules.

1 9. The method of claim 8 further comprising:
2 aborting completion of processing by the unit of
3 work in response to a determination that a violation of a
4 rule has occurred; and
5 committing completion of processing by the unit of
6 work in response to a determination that no violation of
7 a rule has occurred.

1 10. The method of claim 8, wherein each participant has
2 zero or more rules associated therewith.

1 11. The method of claim 8, wherein each rule associated
2 with a unit of work has available for use each
3 participant within the unit of work.

1 12. An enterprise application for use in a computer, the
2 enterprise application comprising:
3 a unit of work, wherein the unit of work accumulates
4 participants that affect a state of the enterprise
5 application;
6 a plurality of business rules, wherein the plurality
7 of rules are used to verify the integrity of the
8 application state; and

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9 a unit of work control point, wherein the unit of
10 work control point locates applicable rules for
11 participants in response to an activation of the unit of
12 work to complete processing of the unit of work.

1 13. The enterprise application of claim 12, wherein the
2 activation of the unit of work control point for the unit
3 of work is initiated by a commit instruction to the unit
4 of work.

1 14. The enterprise application of claim 12, wherein the
2 control point identifies applicable rules for all of the
3 participants in the work of unit.

1 15. The enterprise application of claim 12, wherein the
2 control point applies applicable rules to a portion of
3 the participants in the work of unit.

1 16. The enterprise application of claim 12, wherein the
2 applicable rules are identified based on a name
3 associated with the participant.

1 17. The enterprise application of claim 12, the
2 participant is an object and wherein the name is the
3 class name of the participating object.

1 18. The enterprise application of claim 17, wherein the
2 unit of work is associated with a type and wherein the
3 applicable rules also are identified based on the type
4 associated with the unit of work.

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1 19. A data processing system for performing general
2 integrity checks using rules in an application running on
3 a data processing system comprising:

4 identifying means for identifying a point in a unit
5 of work where application state integrity is to be
6 verified, wherein the unit of work includes a plurality
7 of participants;

8 first obtaining means, responsive to determining
9 that the unit of work is to be completed, for obtaining
10 rules associated with each participant in the unit of
11 work; and

12 second obtaining means, responsive to obtaining the
13 rules, for running the rules obtained for each of the
14 participants to verify the integrity of the system,
15 according to the plurality of participants.

1 20. The data processing system of claim 19, further
2 comprising:

3 aborting means, responsive to a negative result
4 obtained by running the rules, for aborting the unit of
5 work.

1 21. The data processing system of claim 19, further
2 comprising:

3 committing means, responsive to a positive result
4 obtained by running the rules, for committing the unit of
5 work.

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1 22. A data processing system for performing general
2 integrity checks using rules, the data processing system
3 comprising:

4 detecting means for detecting a commit for a unit of
5 work;

6 identifying means for identifying participants in
7 the unit of work in response to detecting the commit for
8 the unit of work;

9 first determining means for determining whether
10 rules are present for the participants in the unit of
11 work;

12 running means for running the rules for participants
13 identified as having at least one rule;

14 second determining means for determining whether a
15 violation of an integrity rule within the rules
16 identified for any participant has occurred; and

17 committing means for committing the unit of work
18 depending on the results of running the rules.

1 23. The data processing system of claim 22 further
2 comprising:

3 aborting means for aborting completion of processing
4 by the unit of work in response to a determination that a
5 violation of a rule has occurred; and

6 committing means for committing completion of
7 processing by the unit of work in response to a
8 determination that no violation of a rule has occurred.

1 24. The data processing system of claim 22, wherein each
2 participant has zero or more rules associated therewith.

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1 25. A computer program product for performing general
2 integrity checks using rules in an application running on
3 a computer program product comprising:

4 first instructions for identifying a point in a unit
5 of work where application state integrity is to be
6 verified, wherein the unit of work includes a plurality
7 of participants;

8 second instructions for responsive to determining
9 that the unit of work is to be completed, obtaining rules
10 associated with each participant in the unit of work; and

11 third instructions for responsive to obtaining the
12 rules, running the rules obtained for each of the
13 participants to verifying the integrity of the system,
14 according to the plurality of participants.

1 26. The computer program product of claim 25, further
2 comprising:

3 first instructions for responsive to a negative
4 result obtained by running the rules, aborting the unit
5 of work.

1 27. The method of claim 25, further comprising:

2 first instructions for responsive to a positive
3 result obtained by running the rules, committing the unit
4 of work.

1 28. A computer program product in a data processing
2 system for performing general integrity checks using
3 rules, the computer program product comprising:

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4 first instructions for detecting a commit for a unit
5 of work;

6 second instructions for identifying participants in
7 the unit of work in response to detecting the commit for
8 the unit of work;

9 third instructions for determining whether rules are
10 present for the participants in the unit of work;

11 fourth instructions for running the rules for
12 participants identified as having at least one rule;

13 fifth instructions for determining whether a
14 violation of an integrity rule within the rules
15 identified for any participant has occurred; and

16 sixth instructions for committing the unit of work
17 depending on the results of running the rules.

1 29. The computer program product of claim 28 further
2 comprising:

3 first instructions for aborting completion of
4 processing by the unit of work in response to a
5 determination that a violation of a rule has occurred;
6 and

7 second instructions for committing completion of
8 processing by the unit of work in response to a
9 determination that no violation of a rule has occurred.

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ABSTRACT OF THE DISCLOSURE

**METHOD AND APPARATUS FOR GENERAL INTEGRITY RULE CHECKING
POINT IN AN APPLICATION**

5

10 A method and apparatus for performing general
integrity checks using rules in an application running on
a data processing system. A point is identified at which
a unit of work is to complete. The unit of work includes
a plurality of participants. Responsive to determining
that the unit of work is to complete, rules associated
with each participant in the unit of work are obtained.
Responsive to obtaining the rules, the rules obtained for
each of the participants are run. Responsive to running
15 the rules, the general integrity of the application state
with respect to the unit of work is determined.
Responsive to determining the general integrity of the
application state, the unit of work is completed by
committing it or aborting it.

1

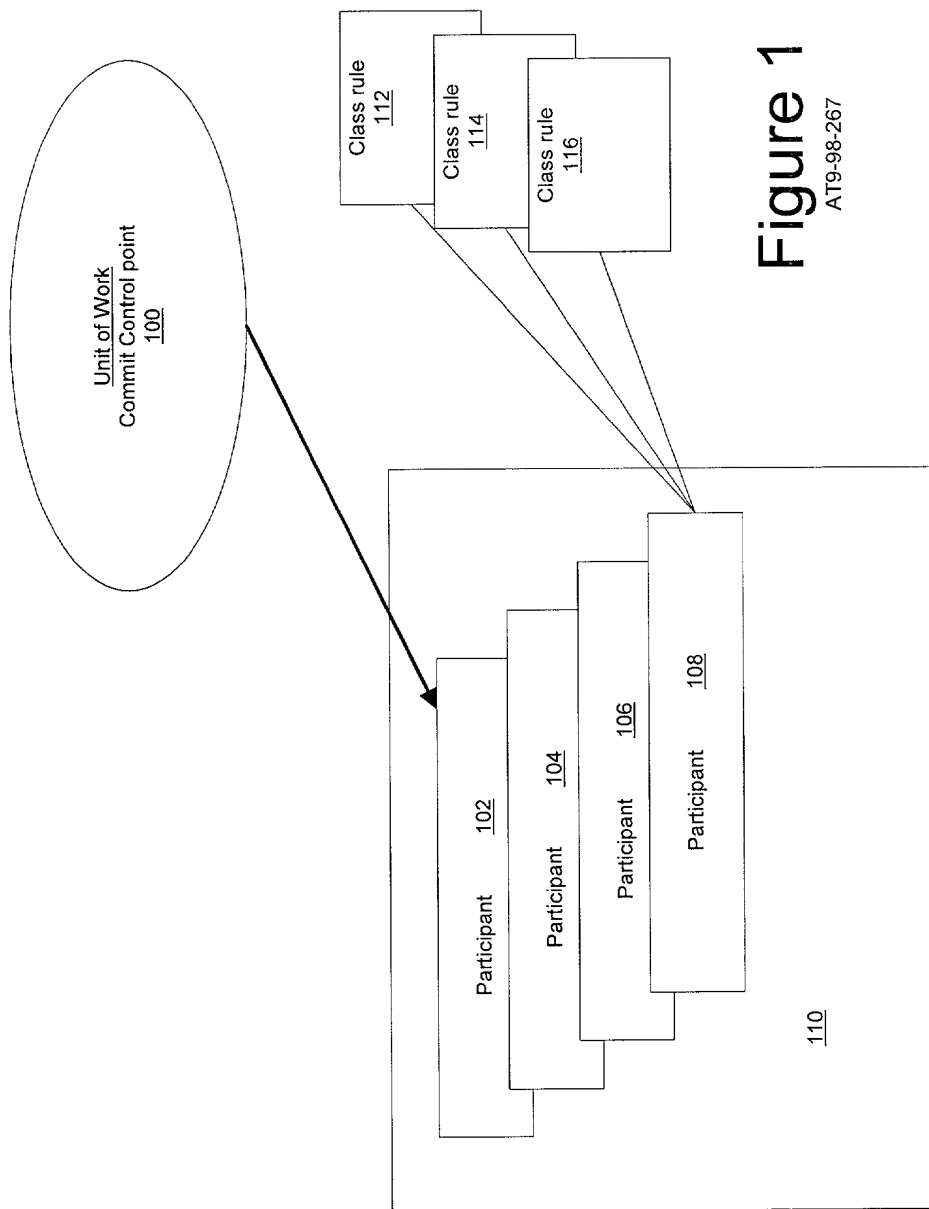


Figure 1

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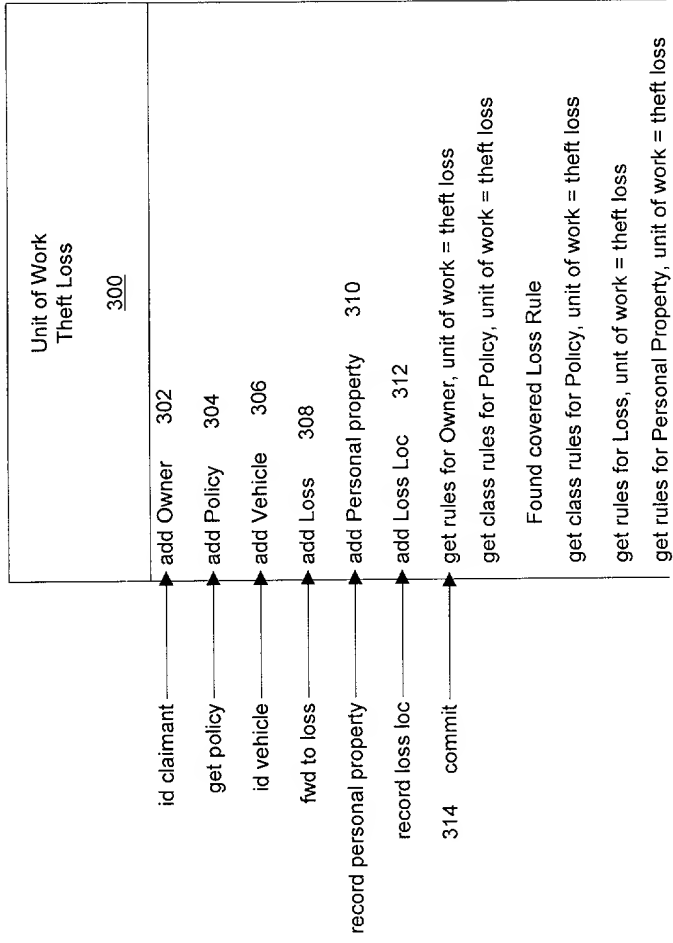


Figure 3

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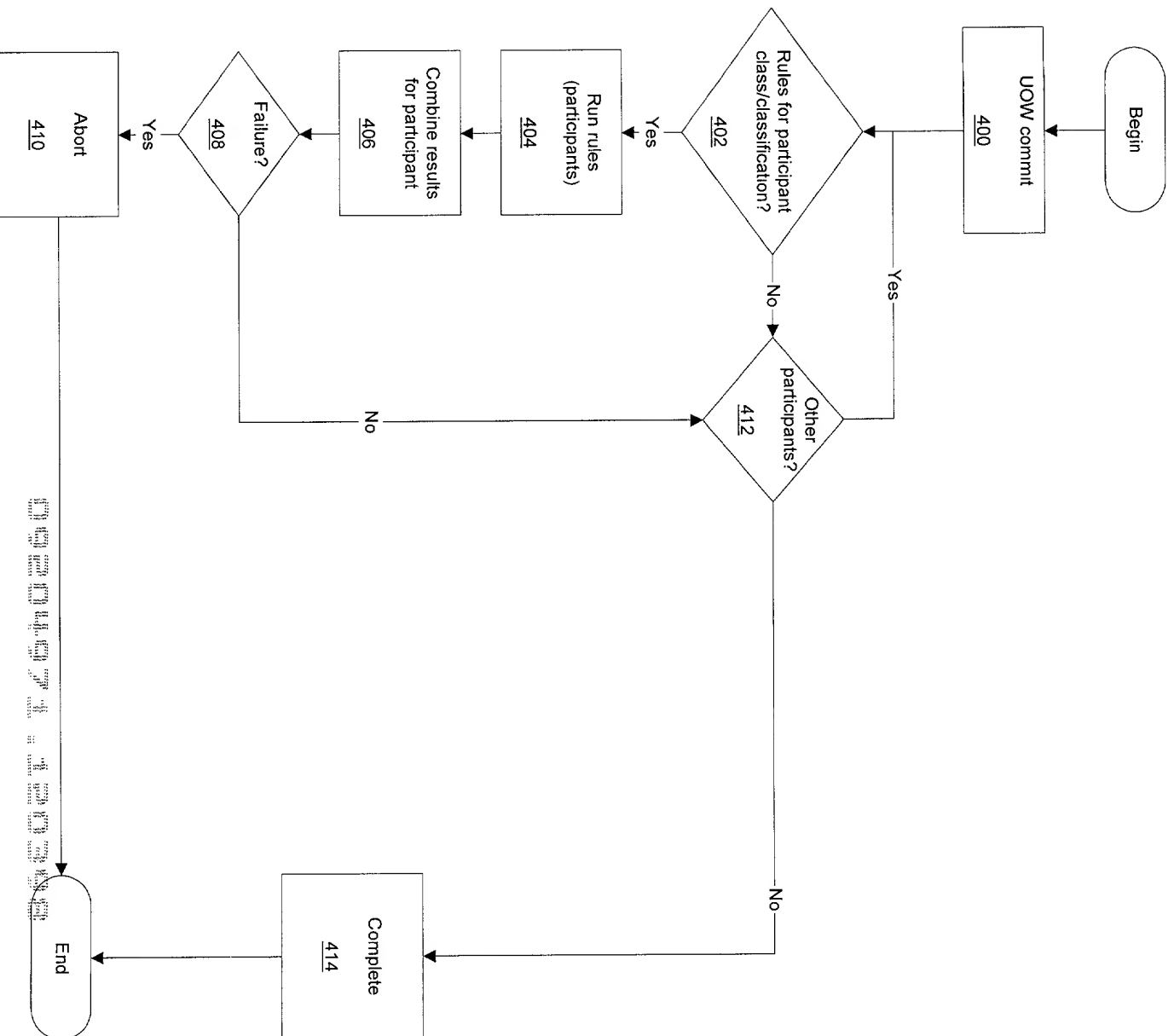


Figure 4
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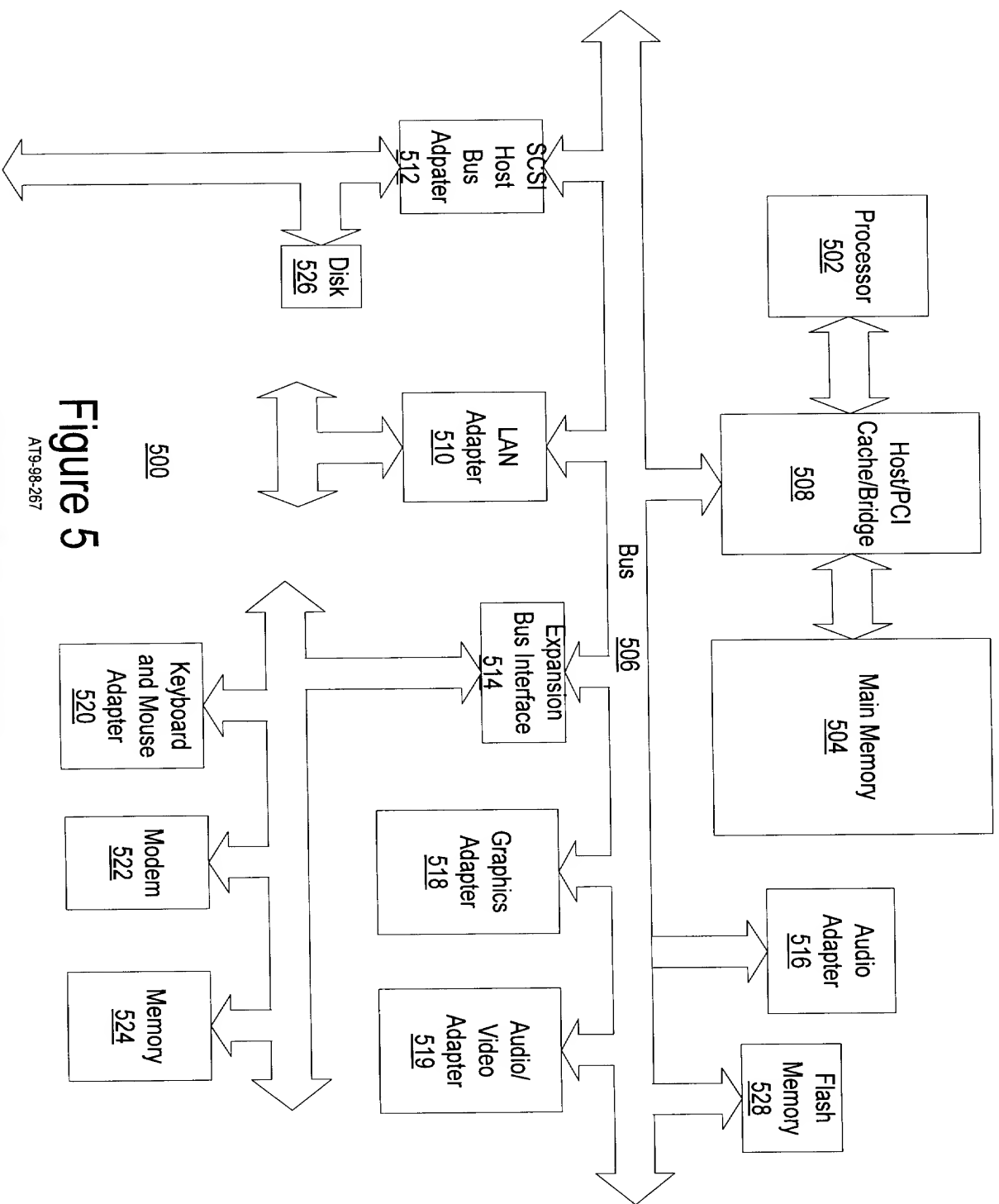


Figure 5

AT9-98-267

**DECLARATION AND POWER OF ATTORNEY FOR
PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Method and Apparatus for General Integrity Rule Checking Point In An Application

the specification of which (check one)

X is attached hereto.

_____ was filed on _____
as Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, ?1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, ?119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Priority Claimed

_____ Yes _____ No
(Number) (Country) (Day/Month/Year)

I hereby claim the benefit under Title 35, United States Code, ?120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, ?112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal Regulations, ?1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial #)

(Filing Date)

(Status)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

John W. Henderson, Jr., Reg. No. 26,907; Thomas E. Tyson, Reg. No. 28,543; James H. Barksdale, Jr., Reg. No. 24,091; Casimer K. Salys, Reg. No. 28,900; Robert M. Carwell, Reg. No. 28,499; Douglas H. Lefevre, Reg. No. 26,193; Jeffrey S. LaBaw, Reg. No. 31,633; David A. Mims, Jr., Reg. 32,708; Volel Emile, Reg. No. 39,969; Richard A. Henkler, Reg. No. 39,220; Anthony V. England, Reg. No. 35,129; Leslie A. Van Leeuwen, Reg. No. 42,196; Christopher A. Hughes, Reg. No. 26,914; Edward A. Pennington, Reg. No. 32,588, John E. Hoel, Reg. No. 26,279; Joseph C. Redmond, Jr., Reg. No. 18,753; Duke W. Yee, Reg. No. 34,285; David W. Carstens, Reg. No. 34,134; Colin P. Cahoon, Reg. No. 38,836.

Send correspondence to: Duke W. Yee, Carstens, Yee & Cahoon, LLP, P.O. Box 802334, Dallas, Texas 75380 and direct all telephone calls to Duke W. Yee, (972) 367-2001.

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CITIZENSHIP: USA

POST OFFICE ADDRESS: Same

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CITIZENSHIP: United Kingdom

POST OFFICE ADDRESS: Same

NOV 17 1998 16:29 FR IBM AUSTIN IPLAW

512 823 1036 TO 78636040

P.02/11

DOCKET NUMBER: AT9-98-267

**DECLARATION AND POWER OF ATTORNEY FOR
PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Method and Apparatus for General Integrity Rule Checking Point In An Application

the specification of which (check one)

X is attached hereto.

— was filed on _____
as Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, ?1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, ?119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Priority Claimed

____ Yes ____ No
(Number) (Country) (Day/Month/Year)

I hereby claim the benefit under Title 35, United States Code, ?120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, ?112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal Regulations, ?1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

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512 823 1035 TO 78636040

P.03/11

DOCKET NUMBER: AT9-98-267

(Application Serial #)	(Filing Date)	(Status)
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Send correspondence to: Duke W. Yee, Carstens, Yee & Cahoon, LLP, P.O. Box 802334, Dallas, Texas 75380 and direct all telephone calls to Duke W. Yee, (972) 367-2001.

FULL NAME OF SOLE OR FIRST INVENTOR: David Lars Ehnebuske

INVENTORS SIGNATURE: _____ DATE: _____

RESIDENCE: 105 Hideaway Cove
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CITIZENSHIP: USA

POST OFFICE ADDRESS: Same

FULL NAME OF SECOND INVENTOR: Barbara Jane Alspach McKee

INVENTORS SIGNATURE: _____ DATE: _____

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Austin, Texas 78746

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FULL NAME OF THIRD INVENTOR: Stewart Laundon Palmer

NOV 17 1998 16:29 FR IBM AUSTIN IPLAW

512 823 1036 TO 78636040

P.04/11

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